NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

AQUACULTURE POND

(Ac.)

CODE 397

DEFINITION

A water impoundment constructed and managed for commercial aquaculture production.

PURPOSE

Provide a favorable aquatic environment for producing, growing, harvesting, and marketing commercial aquaculture crops.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to:

- All impoundments that store water and are managed for commercial aquaculture purposes.

- Embankment impoundments that do not exceed the requirements for Class (a) dams having a product of storage times effective height of dam less than 3,000 acre-ft.^{2} and effective height of dam less than 35 feet, as defined in conservation practice standard 378, Pond.

CRITERIA

General Criteria

A thorough aquaculture resource assessment shall be made to determine the feasibility of the project prior to design. The resource assessment will be based on the species to be cultured and include the ecological needs of the species, physical site conditions, available water quality and quantity, and planned harvesting methods to be employed.

Aquaculture ponds may be:

1. Embankment ponds that intercept and store surface runoff water.

2. Off-channel impoundments or excavated (levee) ponds that are filled by pumping ground water, or diverting spring or stream flows.

The site must be protected from flooding, sedimentation, and non-sediment contamination.

The soils within the pond area as well as those in the contributing drainage area must be checked for residues of pesticides and other harmful chemicals if there is any possibility of

contamination or any known history of past use of these chemicals. If row crops were grown on or adjacent to the site, the top 2 to 4 inches of soil must be checked for long-lasting residual concentrations of chlorinated hydrocarbon insecticides such as toxaphene and DDT.

Acid soils shall be limed to achieve a neutral condition or the desired pH range to optimize production. When multiple ponds are installed, each pond shall be arranged so that it can be managed independently (independent inflows and outflows) of the others to facilitate harvesting and the control of parasites and disease.

All ponds shall be designed to minimize the escape of the cultured species to downstream waters.

A protective cover of vegetation shall be established on all exposed soil surfaces that have been disturbed. If soil or climatic conditions preclude the use of vegetation, other protection methods shall be used.

Water Supply. Any available water source may be used if the quality and quantity are adequate. If water is pumped from rivers and streams or other sources where undesirable fish, pesticide residue, fish disease, and parasites may be introduced, filters must be installed in the pumping system. Water pumped from streams or rivers require an 'Aquatic Resources Alteration Permit' obtained from the Tennessee Department of Environment and Conservation.

Evaporation rates, stocking densities, and species requirements shall be used in establishing specific incoming flow rates.

In general, the water supply shall be adequate to fill the pond completely within ten days. Additional available water capacity of at least 25 gallons per minute per acre of pond surface is required in order to meet potential flushing and maintenance needs.

Water Quality. Water entering the pond shall be aerated to increase dissolved oxygen to a minimum of 5 parts per million, and dissipate harmful gases if needed.

Water temperature and water chemistry shall be suitable for use for stocking density and species requirements in the planned aquaculture production.

Incoming water shall be added as far away from outlet drain as possible to prevent the rapid removal of fresh water from the pond.

Provisions shall be made for any needed treatment of water released downstream from the aquaculture impoundment structure.

All Federal, State, and local regulations will be followed, and necessary permits will be obtained prior to construction and stocking, including the Resident Fish Dealer License obtained from the Tennessee Wildlife Resources Agency and the National Pollutant Discharge Elimination System (NPDES) Permit obtained from the Tennessee Department of Environment and Conservation. The NPDES permit is required to allow a fish farmer to discharge water used back into a receiving stream or water body.

Design Criteria – Embankment Ponds.

Earth fill dams shall meet or exceed the requirements for embankments specified for Pond (378).

The minimum top width of the embankment shall be 16 feet if it will be used as a road for harvesting, feeding, and management purposes and is non-public.

Design Criteria – Excavated Ponds.

Ponds established by excavating and constructing an embankment around their outer perimeter that excludes outside runoff shall have either an auxiliary spillway or a principal spillway pipe installed with sufficient capacity to remove a 10-year/24-hour direct rainfall amount in 48 hours. A minimum 8-inch diameter pipe shall be used.

The minimum top width of interior levees shall be 16 feet. The minimum top width of outside main access levees shall be 20 feet to accommodate equipment and haul trucks.

Levee construction shall add the required embankment settlement to the minimum freeboard requirements. A minimum berm width of 10 feet shall be provided between the outside toe of levee and top of bank of outlet drainage ditch.

Pipes and Conduits. Pump discharge through levees shall be installed above expected high water level, and provisions shall be made to prevent pump and motor vibrations from being transmitted to discharge conduits.

Interior embankments constructed for division of water or to direct water flow for circulation shall have adequate cross-section to ensure stability and function for its intended purpose.

Adequate provisions must be made to protect earth surfaces from turbulent water at pipe inlets and outlets.

Pond Size and Depth. The pond shall be constructed to the recommended size and depth for the species to be grown.

Embankment ponds planned for commercial fish production shall be a minimum of 4 feet up to a maximum depth of 10 feet to withstand drought and low runoff periods.

Drains. All ponds shall have facilities for complete as well as partial drawdown. Turn-down pipes, quick-release valves, bottom-water release sleeves, or other devices for water level control and pond management are to be included in the construction of the drawdown facility as appropriate. Conduit design and seepage control shall meet or exceed the requirements specified for Pond (378).

Pond Bottom. Where fish are harvested by seining, the pond bottom shall be smooth and free of all stumps, trees, roots, and other debris. Existing channels and depressions in the pond area shall be filled and smoothed. The edges of the pond shall be deepened to a 3:1 slope to provide at least 3 feet of water near shore for weed control.

The pond bottom shall be sloped to the outlet at a gradient of at least 0.33 foot per 100 feet.

For shrimp, if an “in-pond” catch basin is planned, it shall be excavated 6 inches deeper than the maximum pond depth and

20 foot square around the drain pipe to concentrate the prawns for harvest.

Access and Safety. Provisions shall be made for access to the site as well as for operation and maintenance. The access ramps, if provided, shall have a grade for equipment access of 4 horizontal to 1 vertical or flatter.

Appropriate safety features shall be made available nearby to aid people who may fall into the pond and devices installed to prevent such accidents.

Fences shall be installed as necessary to exclude livestock and unwanted traffic.

CONSIDERATIONS

The State fishery agency or appropriate State University or research institution should be contacted for recommendation on pond size, water depths, and adapted commercial aquatic species.

Consider any adverse impact to cultural resources when planning for aquaculture ponds.

Other planning considerations include the following:

- The visual design of ponds should be carefully considered in areas of high public visibility and those associated with recreational fishing.

- Consider the effects on the volume of downstream flow or aquifers that might cause undesirable environmental, social, or economic effects and contribute to water table decline from heavy pumping.

- Measures to avoid depredation by birds or other animals should be included in the design.

- A tailwater recovery system may be considered to allow the recirculation and retention of water on site.

- A storage reservoir may be necessary to provide surplus water needed to compensate dry periods.

Buffers or large setbacks to nearby crop fields may be needed to avoid chemical drift. Pond sites immediately adjacent to row crop production should be avoided.

For most aquaculture species, grow-out ponds should be rectangular in shape to facilitate even distribution of feeds and harvesting.

For drain harvesting shrimp ponds, consider at least two drain pipes in a pond for a backup in the event one pipe becomes obstructed. Drain pipes (typically 8-inch to 16-inch diameter) should be large enough to drain the pond within 24-48 hours.

Main access levees used for feeding, harvesting, and hauling equipment should be treated or surfaced (e.g., gravel surface) in accordance with Access Road (560) to provide all weather access.

Desired pH ranges for the proper management of commercially grown species in Tennessee are listed in **Table 1**.

Table 1. Desired pH Ranges for Various Aquaculture Species	
Species	pH Range
Catfish, Channel	6.5 to 9.0
Baitfish, Minnows	6.5 to 9.0
Tilapia*	6.0 to 9.0
Trout, Rainbow	6.5 to 8.0
Shrimp, Freshwater	7.0 to 8.5
• Tilapia aureus is the coldest tolerant species.	

Table 2 lists optional sizes and depths for excavated levee ponds that optimize management.

Table 2 Recommended Size and Depth of Grow-out Levee Ponds for Various Species		
Species	Optimum Size (Ac.)	Depth Range (Ft.)
Catfish, Channel	5-10	3-6
Baitfish, Minnows	0.5-3	3-6
Tilapia	1-10	3-6
Trout, Rainbow	0.5-5	3-10
Shrimp, Freshwater	0.5-3	2.2-4

PLANS AND SPECIFICATIONS

Plans and specifications for constructing aquaculture ponds shall be in keeping with this standard and shall describe the site-specific requirements for applying the practice to achieve its intended purpose.

OPERATION AND MAINTENANCE

A plan for operation and maintenance shall be prepared for use by those responsible for the system. This plan shall provide for inspection, operation, and maintenance of vegetation, pipes, valves, spillways, roads, and other parts of the system.

REFERENCES

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